

Near Infrared Spectroscopy of Astrophysical Molecules

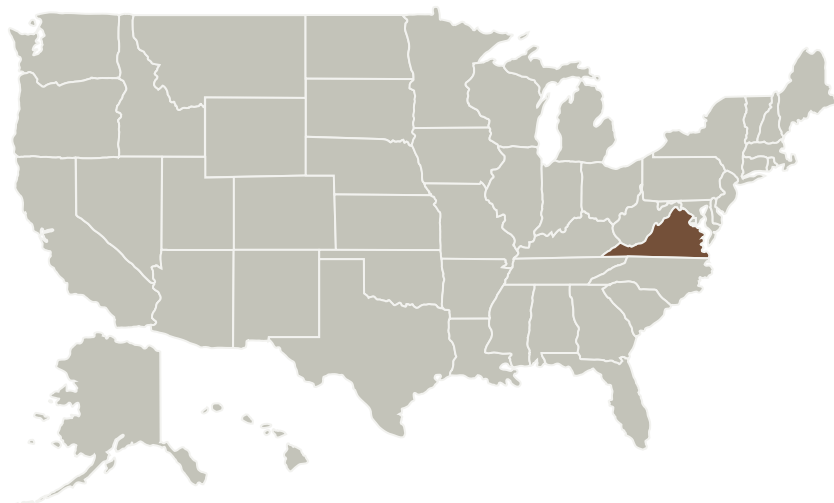
Completed Technology Project (2018 - 2021)



Project Introduction

The theme of this proposal is the laboratory spectroscopy of molecules of importance in cool astronomical objects, including low mass stars, extrasolar planets, brown dwarfs, M-type stars, carbon stars and comets. Our primary focus will be on hot H₂O, CH₄, NH₃, CaOH, and diatomic hydrides and oxides. Hydrogen pressure-broadening parameters will be measured for water, methane and ammonia at high temperature. These molecules are key species for the classification of the spectra of cool stellar and sub-stellar objects including brown dwarfs and exoplanets. We plan to provide line positions, line intensities and lower state energies (plus H₂-broadening coefficients) by combining experimental and theoretical data in an optimal way to create spectral line lists. These line lists are easily converted to molecular opacities that are used to compute spectral energy distributions emitted by cool objects. The experimental part of the research will be carried out by recording Fourier transform spectra using a variety of molecular sources. Cool objects such as brown dwarfs and exoplanets are primary targets for a number of NASA missions such as TESS, Kepler & K2, SOFIA and JWST.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Organization:

Old Dominion University Research Foundation (ODURF)

Responsible Program:

Astrophysics Research and Analysis

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Organizations Performing Work	Role	Type	Location
Old Dominion University Research Foundation(ODURF)	Lead Organization	Academia	Norfolk, Virginia
University of Wuppertal	Supporting Organization	Academia	

Primary U.S. Work Locations

Virginia

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

Peter F Bernath

Co-Investigators:

Sean Jacobs

Per Jensen

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.6 Cryogenic / Thermal

Target Destination

Outside the Solar System